2017 Vermont Stormwater Management Manual
Application Requirements for Operational Permits

Version 2.0 5/2017

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Introduction

This document is intended to ensure the uniform content, arrangement, and submission of State Operational Stormwater permit applications. The contents of this document represent the Stormwater Program's required format for application organization, required material, and supporting information. Failure to adhere to the application submittal requirements presented herein may delay application processing or result in the return or denial of a permit application. Variations to application submittal requirements may be approved by the Agency in advance of submittal, on a case-by-case basis, in consideration of specific circumstances for a particular submittal.

Part 1. Application Submittal Requirements

All permit applications must be submitted on a CD/DVD by mail. Fee payments must be by check, payable to State of Vermont. Application submittals will not be accepted via email or through external document sharing sites. Unless full scale paper copies of site plans are specifically requested by the Stormwater Program, only electronic versions of site plans are preferred.

It is also encouraged that all correspondence on pending permit applications following the initial submittal of the application be conducted via email. This request applies to all regularly submitted stormwater permit applications, including applications for permit coverage under General Permit 3-9010, 3-9015, 3-9020, 3-9030, 3-9003, or their replacement, and all types of individual stormwater discharge permits. Correspondence with the Stormwater Program on issued permits should also be conducted electronically when possible as directed below in this section.

1.1 Application Format

A complete application is comprised of all the applicable application materials and a check for the applicable administrative review and application review fees. These materials should be organized into 6 separate documents, saved individually as PDFs or spreadsheets. The six documents should be named as shown below:

1. "NOI"
2. "Attachment 1: Narrative"
3. "Attachment 2: Workbooks"
4. "Attachment 3: Worksheets"
5. "Attachment 4: Modeling"
6. "Attachment 5: Plans"

Each of the above referenced files should contain the following materials:

1. NOI:
    - A signed Notice of Intent. The most current version can be downloaded from the Stormwater Program website. The applicant(s) and the application preparer should sign the form electronically before sending the final version. To sign the document, please use the Adobe "Sign" tool to place a signature in the signature block. They may choose from the options under "Place Signature" to either "Type My Signature", "Draw my Signature" or "Use an Image." If one has never signed electronically, further help can be found on the Adobe help site.

2. Attachment 1: Narrative
    - The project narrative – prepared in accordance with Narrative Template
    - Location map – showing the outline of the site, the discharge point(s) and the location of the receiving water(s) on a topographical map.
    - Soils map – prepared from the NRCS online Web Soil Survey or the soils data may be overlaid on the existing conditions plan sheet or other plan sheet.

3. Attachment 2: Workbooks
    - STP Selection Tool
    - Standards Compliance Workbook
    - Written justification for the use of Tier 3 Practices (if applicable)

4. Attachment 3: Worksheets
    - Post-Construction Soil Depth and Quality Worksheet
    - STP Worksheets for each STP
    - Standard Waiver Worksheets (if applicable)

    STP Worksheets and Standard Waiver Worksheet should be organized by discharge point in that order. Include section breaks between discharge points.

5. Attachment 4: Modeling
    - Hydrologic modeling for all pertinent rainfall events. See the Modeling section of this document for specific instructions.

6. Attachment 5: Plans
    - Complete plan set including existing condition site plan, proposed condition site plan, detail sheet for all proposed STPs, and an annotated maintenance plan including notes as applicable.

A check shall be included for applicable application fees. Checks should be made payable to the State of Vermont. Do not include a copy of the check on the CD/DVD.
Note: Please do not combine all of the application materials into a single file. Use the above format and file naming convention.

A CD/DVD containing the complete application package can be sent to the following address:

DEC- Watershed Management Division
Stormwater Management Program
1 National Life Drive, Main 2
Montpelier, VT 05620-3522

1.2 Permit Application Correspondence and Revisions
Submission of permit-application related correspondence (e.g. response to technical review comments, plan changes, application material revisions) is requested via email following the initial submittal of the application.

If revisions to original application materials are requested by the Stormwater Program, it is expected that a complete attachment will be re-submitted with the response to comments. For example, if an STP worksheet in Attachment 2 needs to be revised, then the entire Attachment 2 should be resubmitted and named as such "Attachment 2: Worksheets_revised_4-24-15". In certain cases that involve large file sizes, the Stormwater Program may consider allowing single sheets to be revised without re-submittal of the entire attachment. It is advised that you consult with Program district staff in this situation. Also, in the response to comments please indicate the location of any changes to the revised complete attachment (i.e. "bioretention worksheet inserted at p.10 of Attachment 2" or "Modeling revised for 1-year storm event; p. 28-32 of Attachment 4".)

1.3 Correspondence for Issued Permits/Authorizations
All forms, except for the initial application documents, such as Annual Inspection Reports, Restatements of Compliance and transfer forms, should be submitted electronically to:
anr.wsmdstormwatergeneral@vermont.gov

All general correspondence related to a previously issued permit should be directed to the appropriate district technical staff member via email. A district staff directory can be found here:
http://dec.vermont.gov/watershed/stormwater/contacts
All fees must be mailed to the address listed above with checks payable to the State of Vermont for the amount required.

Your assistance in paper-free permit applications is greatly appreciated. For additional stormwater permitting information, please visit the Stormwater Program website:
http://dec.vermont.gov/watershed/stormwater

Part 2: STP Selection Tool

Under the 2017 Vermont Stormwater Management Manual (VSMM), practices acceptable for meeting the Water Quality Treatment Standard have been divided into three tiers: Tier 1, Tier 2, and Tier 3.Tier 1 practices must first be considered, as they provide a higher level of water quality treatment with regard to removal of total phosphorus (TP) and total suspended solids (TSS) and also maximize treatment volume (T_V) credit under the remaining standards as a result of their ability to infiltrate, retain, or reduce stormwater runoff..

The STP Selection Tool provides designers an objective framework to evaluate their projects and determine the highest tier practice that can be used based on site characteristics and the feasibility requirements of each practice. The STP Selection Tool will direct designers through consideration of Tier 1, Tier 2, and Tier 3 STPs for each discharge point. As indicated by the STP Selection Tool and as required by the 2017 VSMM, the use of Tier 3 Practices requires designers to provide written justification for use of Tier 3 Practices based on feasibility, indicating why Tier 1 and Tier 2 Practices cannot be used, along with any relevant supporting information. More information about this justification is provided in the 2017 VSMM (Section 2.2.4.1.).

Part 3: Standards Compliance Workbook

The Standards Compliance Workbook is designed to guide designers through how to calculate and demonstrate compliance with the Standards in the 2017 Vermont Stormwater Management Manual. The workbook must be completed for each discharge point of the project seeking permit coverage. For designers familiar with stormwater permit application submittal under the 2002 VSMM, the workbook replaces the need for Schedule A's, WQ_V and Re_V worksheets. Designers should ensure that the information provided in the workbook is consistent with the impervious surface included for permit coverage on the NOI and the STP Worksheets.

The workbook is comprised of a Summary tab and several discharge point tabs, labeled SN1, SN2, etc. The Summary tab provides an overview of how the Standards are met across discharge points. The workbook contains fields that are to be completed by the designer, fields that will auto-populate based on designer-entered information, as well as optional fields that may be completed by the designer when applicable. The designer will primarily enter information on discharge the discharge point tabs to describe site conditions and treatment used. The Standards Compliance Workbook is supported by the sizing and volume (T_V) calculations completed in the STP Worksheets completed for each STP, in addition to hydrologic modeling results prepared by designers. (See Part 4: Worksheets.)

3.1 Discharge Points

A **discharge point** is defined as the location where stormwater runoff form the site first encounters Waters of the State. **Waters** means all rivers, streams, creeks, brooks, reservoirs, ponds, lakes, springs, and all bodies of surface waters, artificial or natural, which are contained within, flow through, or border upon the state of Vermont or any portion of it. Wetlands, which are in most cases surface waters, are often identified as an unnamed tributary to "first-named" waters of the State. The **site** is generally defined as the area occupied by the impervious and disturbed pervious areas on the project, and may include undisturbed areas proposed for reforestation/tree planting, and undisturbed vegetated buffers or other areas utilized for non-structural treatment. A complete definition of site can be found in Subchapter 7.0 of the 2017 VSMM.

When discharge points are located far from the site boundary, applicants may use points of interest (POIs) as locations where compliance is demonstrated. A POI is a location where flow discharges from the site, but that can be well upslope of the discharge point (Waters of the State). In general, if compliance with the treatment standards is demonstrated at a site boundary POI, then compliance will be assumed at the actual discharge point. A designer may utilize the discharge point tabs in the workbook (SN1, SN2, etc.) for information specific to a POI.

3.2 Filling out the workbook when using Site Balancing

The Site Balancing Design Strategy (2017 VSMM, Section 2.1.1.) may be used when control or treatment of certain areas of expanded or redeveloped impervious surface is not reasonably feasible or will have marginal benefits due to site constraints. Under site balancing, the impact from those areas is compensated for by providing equivalent treatment of surfaces within the project limits that would not otherwise be subject to treatment or control requirements. This can be accomplished by providing additional control or treatment beyond what is required for redeveloped impervious surfaces or by controlling or treating impervious surfaces that are not otherwise required to provide stormwater treatment.

When Site Balancing is used, the Standards Compliance Workbook must always be completed to reflect actual pre-development and post-development conditions. If existing impervious is being treated, that area should be identified on the plans and also identified in the application narrative, and subsequently reflected in STP Worksheet and STP design and sizing. For example, if you are expanding impervious by 0.25 acres and site constraints prevent you from treating the expanded portion to current standards, treatment may be provided for 0.25 acres of existing impervious, if treatment is otherwise required for that impervious.

For projects that utilize site balancing, the Workbook must be completed as follows:

- List the new impervious under the “Post-Development Land Use” section, even though it is not receiving treatment. This will allow the workbook to correctly calculate the required treatment volumes.
- List the existing impervious in the “Pre-Development Land Use” section.
- Indicate in the “General Notes” field located at the bottom of the “Summary” tab that Site Balancing is used, identify the amount of existing impervious surface treated in lieu of new impervious that cannot be treated, the location of each impervious surface (by discharge point), and a description of the treatment provided.
    - For example, “*Site Balancing was used for discharge point SN1. 0.25 acres of existing impervious surface, also located in SN1 has been treated with a proposed Dry Swale as identified on site plan A1.*”
    - Designers that voluntarily treat more than required under Site Balancing may note this larger impervious area treated.

Please make sure all the areas of new impervious, treated existing impervious, untreated existing impervious, redeveloped impervious, and removed impervious are clearly identified on a site plan as well as in the narrative (a table with areas of each type of impervious is helpful) when utilizing the Site Balancing Design Strategy.

3.3 Filling out the workbook when using Net Reduction

The Net Reduction Design Strategy (2017 VSMM, Section 2.1.1.) may be used on developed sites that pre-date modern stormwater design requirements, that may present unique opportunities to greatly improve stormwater treatment and control. Expansion and redevelopment projects often involve reconfigurations of parking, drives, or buildings that can result in a net reduction in impervious surface, despite the creation or redevelopment of impervious that trigger the need for a stormwater discharge permit. A net reduction of impervious surface can have both stormwater quality and volume reduction benefits. While the Water Quality Treatment Standard applicable to redevelopment allows for credit towards removal impervious, an overall net reduction in impervious is not specifically considered.

When Net Reduction is used, the Standards Compliance Workbook must always be completed to reflect actual pre-development and post-development conditions. The workbook calculates the difference between the pre and post-developed impervious to determine if impervious cover has been reduced by the proposed project. The designer must select whether the reduction will be applied as part of redevelopment standards or net reduction. Based on the selection, the workbook will alter the required WQ_V for that discharge point. "Net Reduction" may be selected from the dropdowns in the sections for Channel, Overbank, and Extreme Flood Protection as justification why those standards do not apply. The designer should note in the "General Notes" field located at the bottom of the "Summary" tab that Net Reduction is used and shall identify the amount of existing impervious surface being reduced and how the project in general used this design strategy to reduce the overall required Water Quality Volume (WQ_V).

All areas of new impervious, treated existing impervious, untreated existing impervious, redeveloped impervious, and removed impervious shall be clearly identified on a site plan as well as in the narrative (a table with areas of each type of impervious is helpful) when utilizing the Net Reduction Design Strategy.

3.4 Terminology

Definitions are specified in Subchapter 7.0 of the 2017 Vermont Stormwater Management Manual. Additional information is provided here to assist designers in permit application preparation and design.

<u>Receiving Waters</u>: The receiving water is the name of the Water of the State that stormwater runoff from the site first enters. If the receiving water does not have a name, use the designation of "unnamed tributary to the X," where X is the first named waterbody. "Waters" means all rivers, streams, creeks, brooks, reservoirs, ponds, lakes, springs, and all bodies of surface waters, artificial or natural, which are contained within, flow through or border upon the state of Vermont or any portion of it. If the receiving water is a wetland, be specific as to the wetland's relationship to other waters. For instance: 1) Wetland tributary to X; or 2) Wetland draining into X. In situations where all of the stormwater is discharged to groundwater (infiltrated), the receiving water is "groundwater within the X watershed." In the instance that the site discharges to groundwater, but some overflow is expected via surface runoff into a Water of the State, the receiving water is "groundwater with overflow to X."

Latitude & Longitude of Discharge Point: This is the location in Decimal Degrees (including at least the first five digits after the decimal point) format where the runoff from your site first enters a water for each discharge point.

Existing Impervious Surfaces: Existing impervious surfaces shall be identified in the Standards Compliance Workbook representative of both pre- and post-development conditions. Existing impervious surfaces that are not proposed for permit coverage and do not require permit coverage or treatment may be excluded from the NOI. Existing impervious surfaces that are included for permit coverage must meet applicable treatment standards.

Redevelopment: If you are redeveloping an area of impervious surface whose discharge is covered under an existing stormwater discharge permit (valid or expired) please contact the Stormwater Program to discuss whether coverage of this impervious surface is required under a new stormwater discharge permit or can be authorized under the existing permit. Typically, redeveloped surfaces are held to a reduced Water Quality Standard, however in cases where the areas were previously permitted as new or held to another standard under a previously issued permit, "backsliding" on treatment or control would not be permittable. Please refer to Chapter 18 or Chapter 22 of the Environmental Protection Rules, for full definition of redevelopment.

Part 4: Worksheets

Every project application must include a completed Post-Construction Soil Depth and Quality Worksheet, along with a supporting soils plan indicating the areas that will be subject to the standard and locations of the proposed test pits. A single Post-Construction Soil Depth and Quality worksheet shall be submitted for each site.

STP Worksheets must be completed for the primary treatment STPs that are to be used on the project. Completion of the STP Worksheets will allow for the calculation of the STP's treatment volume (T_V), the volume that will be applied to all standards under the runoff reduction framework of the 2017 VSMM, including the Hydrologic Condition Method of the Channel Protection Standard. The STP Worksheets also cover some of the required design elements for STPs to ensure that the STP is designed according to the Manual. Designers however are urged to review the complete list of required elements in the Manual, as the STP Worksheets are not inclusive of all requirements, but focus on key elements.

Most questions on the worksheets refer to required elements in the 2017 Vermont Stormwater Management Manual and therefore must be addressed. An answer of "No" to a required element is subject to Agency approval and must be accompanied by a detailed explanation and certification of why this design element is not met and whether the minor variation from numerical design criteria will not compromise equivalent performance of the STP. Some questions ask if a particular design element, such as check dams or an underdrain, will be used by the STP. Selection of "Yes" may cause further question to populate the worksheet that must be answered.

Worksheets applicable to each discharge point shall be bundled together. The bundle, is then included in a single PDF called "**Attachment 3: Worksheets.**" The Attachment 3: Worksheets PDF will include the Post-Construction Soil Depth and Quality, STP Worksheets, and Standard Waiver Worksheets (if applicable) in that order. grouped by discharge point.

All worksheets can be found here:

http://dec.vermont.gov/watershed/stormwater/permit-information-applications-fees/operational-stormwater-discharge-permit-application-materials

Part 5: Runoff Modeling

The information presented here aims to make the review of operational stormwater application information specific to hydrologic modeling more efficient. This information also sets forth the expected format and methods to be used when completing modeling to ensure application consistency. Below are several figures showing modeling outputs that have been underlined or circled in red indicating that these items are expected to be highlighted on the modeling output summary sheets prepared by the designer and submitted with the application to clearly demonstrate compliance with applicable treatment standards. The below figures depict one type of software that is commonly used for preparing the required modeling. The Agency accepts similar modeling based on TR-20 or approved equivalent for determining stormwater runoff volume, determining peak discharge rates, and for routing of detention STPs. If the project reports are printed directly to PDF the pertinent text can be highlighted or otherwise marked with tools in Adobe without printing a hard copy of the reports, thus this request can be met while maintaining the goal of paperless applications.

5.1 General Model Information

On the first subcatchment summary sheet for each storm event please highlight the following information:

- Runoff generation method (shall be flow weighted (Weighted-Q), not area weighted (Weighted-CN)), (Weighted-CN only accepted with prior Agency approval)
- Unit hydrograph used
- Model time span
- Model time step
- Rainfall distribution type
- Rainfall amount

Summary for Subcatchment 1e: Existing Basin 1

Runoff = 2.03 cfs @ 12.05 hrs, Volume= 0.128 af, Depth= 0.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 1.00-90.00 hrs, dt= 0.01 hrs
Type II 24-hr 1yr Storm Rainfall=2.20"

Area (ac)	CN	Description
0.033	77	Woods, Good, HSG D
2.626	77	Woods, Good, HSG D
0.099	70	Woods, Good, HSG C
0.046	70	Woods, Good, HSG C
2.804		Weighted Average
2.804		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					**Direct Entry, Watershed Lag**

Figure 1: Subcatchment summary sheet showing the general model information that should be highlighted on the first subcatchment summary sheet for each rainfall event.

5.2 Water Quality Treatment Standard

When modeling the Water Quality Storm (1.0") with NRCS methods a modified CN must be used. On the subcatchment summary sheet for the Water Quality Storm please highlight the modified CN that was calculated using Equation 2-3 in the 2017 VSMM, found in Section 2.2.4.2.

	Area (ac)	CN	Description
*	1.200	88	Modified CN
	1.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description

Figure 2: Subcatchment summary sheet for the Water Quality Storm showing the use of a Modified CN.

5.3 Channel Protection Standard (CP_V)

Discharge points that meet the Channel Protection Standard entirely by use of the Hydrologic Condition Method (HCM) may not require the above modeling when STPs have been sized for the required T_V based on infiltration rate, contributing drainage, and practice geometry, in consideration of all applicable design requirements. Designers may opt to provide modeling to demonstrate exfiltration of the required T_V.

Discharge points that partially meet the Channel Protection Standard by use of the HCM, will use an adjusted Curve Number (CN) (2017 VSMM, Section 2.2.5.3) in the model to account for any T_V that was provided and shall demonstrate extended detention for any remaining channel protection volume.

To demonstrate compliance with the Channel Protection Standard when met with Extended Detention (ED) please highlight the Center of Mass detention time on the pond/practice summary sheet. The Center of Mass detention time should be as close to 720 minutes as possible for a 12-hour detention time for or 1440 minutes if a 24-hour detention time, depending on the fisheries designation of the receiving water.

The model time span must be long enough so that the pond elevation returns to the permanent pool elevation for the 1-year, 24-hour storm. Otherwise, the center of mass detention time reported by the software may be truncated. This can be confirmed by verifying that the inflow and outflow volumes are the same.

If the STP has a permanent pool, the model shall only consider the area above the permanent pool for compliance with the Channel Protection Standard. This can be accomplished by setting the starting elevation at the permanent pool elevation, or by not defining the permanent pool storage.

Inflow Area = 1.000 ac,100.00% Impervious, Inflow Depth = 2.77"
Inflow = 3.68 cfs @ 12.01 hrs, Volume= 0.231 af
Outflow = 0.11 cfs @ 14.36 hrs, Volume= 0.231 af, Atten= 97%, Lag= 141.3 min
Primary = 0.11 cfs @ 14.36 hrs, Volume= 0.231 af

Routing by Stor-Ind method, Time Span= 0.00-140.00 hrs, dt= 0.05 hrs
Starting Elev= 6.75' Surf.Area= 2,700 sf Storage= 2,588 cf
Peak Elev= 8.41' @ 14.36 hrs Surf.Area= 5,513 sf Storage= 9,078 cf (6,490 cf above start)

Plug-Flow detention time= 1,064.8 min calculated for 0.171 af (74% of inflow)
Center-of-Mass det. time= 727.7 min (1,485.3 - 757.6)

Volume	Invert	Avail.Storage	Storage Description
#1	5.00'	12,800 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
5.00	0	0	0
6.00	1,800	900	900
7.00	3,000	2,400	3,300
8.00	4,500	3,750	7,050
9.00	7,000	5,750	12,800

Device	Routing	Invert	Outlet Devices
#1	Primary	6.75'	**1.8" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.11 cfs @ 14.36 hrs HW=8.41' (Free Discharge)
└1=**Orifice/Grate** (Orifice Controls 0.11 cfs @ 6.05 fps)

Figure 3: Subcatchment summary sheet showing an appropriate model time span and center of mass detention time, verified by equivalent inflow and outflow volumes.

The minimum orifice size is 1 inch; designers will not be required to demonstrate more detention time than a 1 inch orifice can provide. However, to maximize the detention time provided by the 1 inch orifice, the pond should have the available storage to contain the CP_V between the 1 inch orifice and the next highest outlet control (i.e. there should be no discharge through the next highest outlet control for the 1-year storm.)

5.4 Overbank Flood Protection Standard (Q_{P10}) and Extreme Flood Protection Standard (Q_{P100})

Compliance with these standards is met by demonstrating that the routed post-development peak discharge rate does not exceed the pre-development peak flow rate for the 10-year, 24-hour and 100-year, 24-hour storms, under the Type II rainfall distribution ($Q_{P10post} \leq Q_{P10pre}$ and $Q_{P100post} \leq Q_{P100pre}$). To demonstrate this in the modeling output, highlight the peak flow rate from the most downstream node in the pre-development/existing condition and the most downstream node in the proposed condition to show that the flow rate from the proposed condition is less than or equal to the existing condition. In the example below, the peak flow rate from node 5S would be compared to the peak flow rate from node 3P for demonstrating compliance with the Overbank Flood Protection (Q_{P10}) and Extreme Flood Protection (Q_{P100}) Standards.

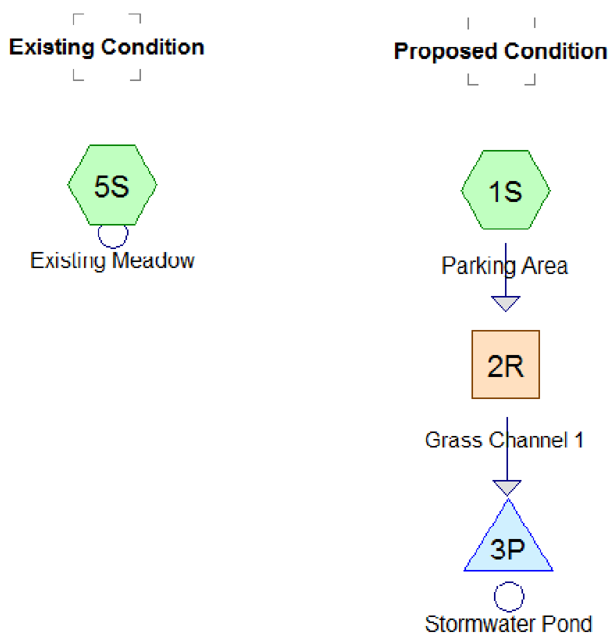

Figure 5: Routing diagram for the Overbank Flood Protection and Extreme Flood Protection Standards example.

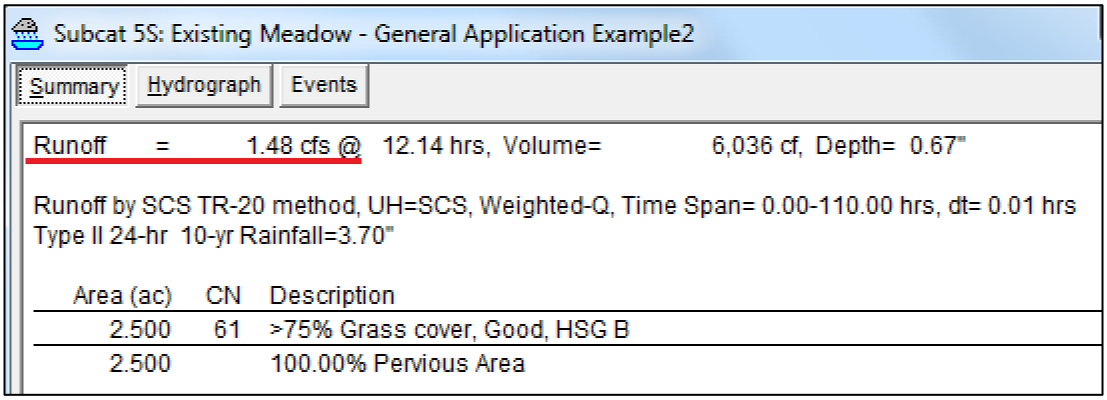

Figure 6: Subcatchment summary sheet showing peak flow rate for the pre-development condition for node 5S.

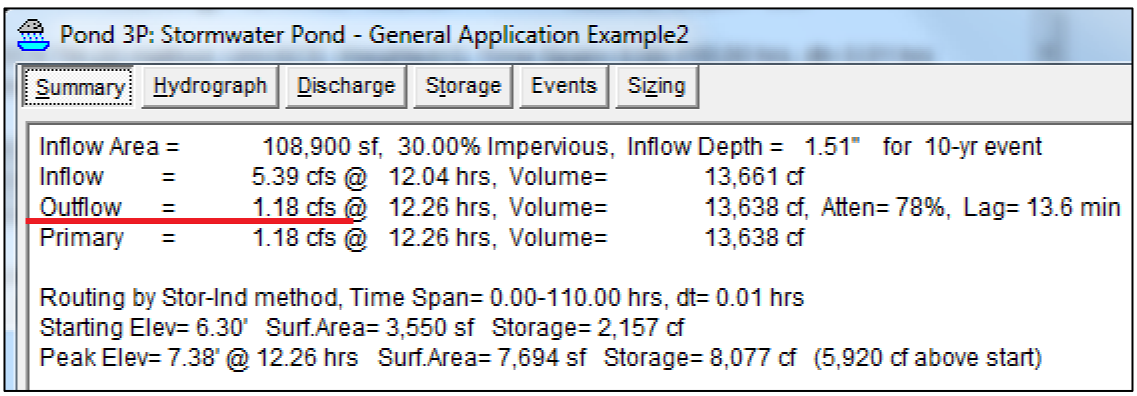

Figure 7: Subcatchment summary sheet showing the peak flow rate for the proposed condition.

Note that for practices with multiple outflow designations (primary and secondary) the flows should be combined. For ponds with exfiltration specified as an outlet control (discarded flows) this flow will be considered in the total Outflow calculation, but does not need to be considered for compliance purposes with the Q_{P10} and Q_{P100} standards. In these cases, the total flow rate for compliance purposes is the outflow less the discarded flow.

Discharge points that partially meet the Overbank Flood Protection Standard and/or Extreme Flood Protection Standard by use of the HCM, will use an adjusted Curve Number (CN) (2017 VSMM, Section 2.2.5.3) in the model to account for any T_V that was provided, rather than representing by exfiltration (discarded flows).

In addition to demonstrating compliance with each standard, conformance with stormwater treatment practice requirements should also be demonstrated by highlighting pertinent information on the modeling summary sheets for the specific practice being used to meet the standards. If a “Required Element” in VSMM is possible to demonstrate in the modeling, it should be highlighted in the modeling to demonstrate compliance. This will facilitate the efficient review of a permit application.

5.5 Wet Ponds/Practices Utilized for Detention

The following elements for wet ponds and stormwater treatment practices that provide either a permeant pool and/or detention volume should be highlighted in the modeling output:

- 1-year peak flow rate from the pond outlet
- Volume of the permanent pool
- Starting elevation (based on elevation of permanent pool and lowest outlet control)
- Outlet control structure type, size, and invert elevation (including barrel), consistent with the provided outlet control structure detail
- Outlet routing diagram demonstrating proper routing of the various outlet control structures through the riser barrel

Summary Sheet:

```
Inflow Area =     119,790 sf,  36.36% Impervious,  Inflow Depth =   0.84"   for  1-yr event
Inflow     =      2.56 cfs @  12.15 hrs,  Volume=          8,415 cf
Outflow    =      0.23 cfs @  13.04 hrs,  Volume=          8,394 cf,  Atten= 91%,  Lag= 53.5 min
Primary    =      0.23 cfs @  13.04 hrs,  Volume=          8,394 cf
```

1-yr Peak Flow Rate

```
Routing by Stor-Ind method, Time Span= 0.00-110.00 hrs, dt= 0.01 hrs
Starting Elev= 6.30'  Surf.Area= 3,550 sf  Storage= 2,157 cf
Peak Elev= 7.21' @ 13.04 hrs  Surf.Area= 6,948 sf  Storage= 6,864 cf  (4,706 cf above start)

Plug-Flow detention time= 1,082.4 min calculated for 6,236 cf (74% of inflow)
Center-of-Mass det. time= 720.8 min ( 1,526.4 - 805.7 )
```

Volume	Invert	Avail.Storage	Storage Description
#1	5.00'	13,750 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
5.00	0	0	0
6.00	2,500	1,250	1,250
6.30	3,550	907	2,157
7.00	6,000	3,343	5,500
8.00	10,500	8,250	13,750

Volume of Permanent Pool

Device	Routing	Invert	Outlet Devices
#1	Primary	5.00'	**12.0" Round Culvert** L= 50.0' Ke= 0.010 Inlet / Outlet Invert= 5.00' / 4.00' S= 0.0200 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 0.79 sf
#2	Device 1	6.30'	**1.7" Vert. Orifice/Grate** C= 0.600
#3	Device 1	7.15'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Outlet Device Summary Table indicating outlets that conform with outlet control structure detail

```
Primary OutFlow  Max=0.22 cfs @ 13.04 hrs  HW=7.21'  (Free Discharge)
└─1=Culvert  (Passes 0.22 cfs of 3.59 cfs potential flow)
   ├─2=Orifice/Grate  (Orifice Controls 0.07 cfs @ 4.41 fps)
   └─3=Orifice/Grate  (Weir Controls 0.15 cfs @ 0.81 fps)
```

Outlet Routing Diagram- Outlet devices properly routed through riser barrel

Figure 10: Summary sheet showing pertinent information that needs to be highlighted

5.5.1 Outlet Routing

The use of compound outlet structures is common for stormwater treatment practices. When modeling a compound outlet structure, it is important to include not only the various outlet control structures on the riser, but also the riser barrel where flows from the individual outlet control devices combine before discharging to a stable conveyance or receiving body.

Designating an outlet device as Primary assumes free discharge for that device. In compound outlet structures (risers with multiple outlet control devices) this is often not a valid assumption, as the barrel can act to control flow rate even if the sum of individual outlet control devices could potentially pass more flow.

Proper outlet routing involves specifying the barrel as an outlet control device, designating it as the primary outflow, and then routing the other outlet control devices on the riser (orifices, weirs, overflow grates) through the barrel. The easiest way to do this is to enter the barrel (as a culvert) as Device #1 in the "Outlet" table and then route the other devices through Device #1, as shown below:

Device	Routing	Invert	Outlet Devices
#1	Primary	5.00'	**12.0" Round Culvert** L= 50.0' Ke= 0.010 Inlet / Outlet Invert= 5.00' / 4.00' S= 0.0200 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 0.79 sf
#2	Device 1	6.30'	**1.7" Vert. Orifice/Grate** C= 0.600
#3	Device 1	7.15'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.18 cfs @ 12.26 hrs HW=7.38' (Free Discharge)
└─**1=Culvert** (Passes 1.18 cfs of 3.72 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.08 cfs @ 4.83 fps)
  └─**3=Orifice/Grate** (Weir Controls 1.11 cfs @ 1.56 fps)

Figure 11: Outlet summary table and routing diagram showing inclusion of the barrel and proper routing of the other outlet control devices.

This will ensure that flows are properly combined in the barrel and will allow for barrel control if necessary. Note that the barrel should be modeled at the size specified in the outlet structure detail.

Stormwater Wet Ponds or stormwater Shallow Surface Treatment Wetlands that require the use of a Gravel Outlet Trench, modeling may consider only the outlet size and elevation as it exits the trench and will not be required to consider porosity through the stone associated with the gravel outlet trench in route to the outlet.

5.5.2 Starting Elevation

Practices, such as Wet Ponds and Shallow Surface Treatment Wetlands, with established permanent pools must also include the elevation of the permanent pool in the modeling. This is done by specifying a pond starting elevation to ensure that the volume of the permanent pool is not counted toward the available storage volume of the pond. The inflow and outflow volumes should be the same for a given rainfall event. If the outflow is significantly less than the inflow, this may indicate that the starting elevation has not been appropriately set. The starting elevation of the pond is established by the elevation of the lowest outlet control in the pond. The pond summary sheet below illustrates a properly established starting elevation for a wet pond with a permanent pool.

Inflow Area = 2.000 ac, 0.00% Impervious, Inflow Depth = 4.16" for 100-yr event
Inflow = 13.41 cfs @ 11.98 hrs, Volume= 0.693 af
Outflow = 1.34 cfs @ 12.41 hrs, Volume= 0.693 af, Atten
Primary = 1.34 cfs @ 12.41 hrs, Volume= 0.693 af

Inflow and outflow volumes are equivalent

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs
Starting Elev= 814.00' Surf.Area= 3,000 sf Storage= 2,500 cf
Peak Elev= 816.14' @ 12.41 hrs Surf.Area= 12,830 sf Storage= 17,718 c

Starting elevation listed between routing info and peak elevation

Plug-Flow detention time= 277.2 min calculated for 0.635 af (92% of inflow
Center-of-Mass det. time= 201.0 min (990.5 - 789.4)

Volume	Invert	Avail.Storage	Storage Description
#1	812.00'	31,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
812.00	0	0	0
813.00	1,000	500	500
814.00	3,000	2,000	2,500
815.00	6,000	4,500	7,000
816.00	12,000	9,000	16,000
817.00	18,000	15,000	31,000

Device	Routing	Invert	Outlet Devices
#1	Primary	812.00'	**12.0" Round Culvert** L= 50.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 812.00' / 811.50' S= 0.0100 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 0.79 sf
#2	Device 1	814.00'	**3.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	815.00'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limite

Starting elevation is determined by elevation of lowest outlet control

Primary OutFlow Max=1.34 cfs @ 12.41 hrs HW=816.14' (Free Discharge)
└**1=Culvert** (Passes 1.34 cfs of 4.45 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.34 cfs @ 6.83 fps)
  └**3=Orifice/Grate** (Orifice Controls 1.01 cfs @ 5.14 fps)

Figure 12: Summary sheet showing a properly established pond starting elevation to represent the permanent pool. Please highlight these items if using a pond with a permanent pool.

Notice that the inflow and outflow volumes are equivalent, and that the starting elevation corresponds with the elevation of the lowest outlet control on the compound outlet structure.

5.6 Stormwater Treatment Wetlands

Stormwater Shallow Surface Treatment Wetlands share many of the same required elements as Stormwater Wet Ponds. Unless specified in the 2017 VSMM, all of the pond criteria listed above also apply to Shallow Surface Treatment Wetlands including: conveyance criteria, outlet control device routing, forebay depths, and ponding depths for permanent pools. Refer to the above pond section for a list of requirements that can be demonstrated in modeling output for Shallow Surface Treatment Wetlands.

Stormwater Wet Ponds or Shallow Surface Treatment Wetlands that require the use of a Gravel Outlet Trench, modeling may only consider the outlet structure sizing and elevation located within the trench and will not be required to consider porosity through the stone associated with the gravel outlet trench in route to the outlet.

5.7 Infiltration Practices

Designers may not require the above modeling when Infiltration Practices (including dry swales, filters, and bioretention practices designed to infiltrate) have been sized for the required T_V based on infiltration rate, contributing drainage, and practice geometry, in consideration of all applicable design requirements. Designers may opt to provide modeling to demonstrate exfiltration of the required T_V.

When modeling infiltration practices to demonstrate T_V infiltrated or compliance with other standards, the designer shall not use a CN_{Adj} that takes into account the practice being modelled. For example, if the designer is attempting to demonstrate that outflow from an infiltration basin will satisfy Q_{P10}, the adjusted curve number shall not reflect T_V credit from the infiltration basin. The CN may be adjusted based on any upstream Tier 1 practices, provided they are not explicitly modelled.

The following required elements for infiltration practices should be highlighted in the modeling output when modeling in necessary:

- Exfiltration by constant velocity limited to 0.01 ft. above the floor of the practice OR by constant flow rate at all elevations by calculation from the infiltration rate and the bottom area of the practice (see example below).

Infiltration is typically modeled by selecting “Exfiltration” as the outlet control device and specifying “Discarded” as the routing option. Exfiltration can correctly be modeled using either a constant velocity (infiltration rate) over the surface area of the bottom of the practice or constant flow rate (product of infiltration rate and bottom area of practice). Both approaches are demonstrated below.

5.7.1 Constant Velocity Infiltration

This approach involves entering the field verified infiltration rate into the model as the velocity term and limiting infiltration to a very small height (0.01 ft.) above the bottom elevation of the practice. This will restrict infiltration to the bottom of the practice only. If side slopes are to be considered, this height may be adjusted. If an infiltration basin has a bottom surface area of 2,000 sf, a bottom elevation of 2.00 ft. and an infiltration rate of 5.00 in/hr the correct way of setting this up using HydroCAD modeling software would be as follows:

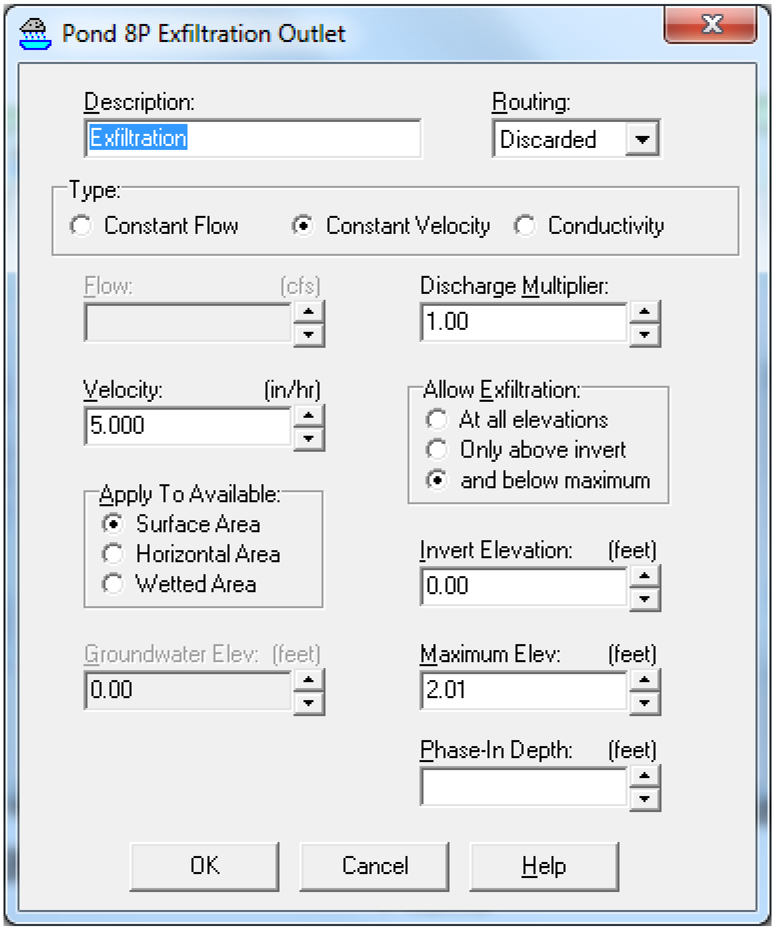

Figure 13: Exfiltration screen showing constant velocity exfiltration.

Note that although the bottom elevation of the basin is at 2.00 ft., the invert elevation is specified as 0.00 ft. This is because the model treats the invert elevation as an impervious layer, through which there is no infiltration. Because of this, the invert elevation specified on the infiltration screen must be less than the actual bottom elevation of the infiltration basin. In effect, it doesn't matter how much less; the invert elevation could be 1.99 ft. and the model will respond in the same manner as if it were 0.00 ft.

Specifying the invert elevation less than the bottom elevation of the basin allows for infiltration through the entire bottom surface area of the basin, and specifying the maximum exfiltration elevation as 0.01 ft. above the bottom elevation of the basin minimizes exfiltration through the side slopes of the basin. The 2002 VSMM previously specified that only the bottom of the basin could be considered for infiltration area, which may be advisable and a conservative design approach, dependent on site and project specifics, however this may be adjusted to consider infiltration through side slopes under the 2017 VSMM. The output summary for the example model is included below:

Inflow Area = 119,790 sf, 36.36% Impervious, Inflow Depth = 0.84" for 1-yr event
Inflow = 2.95 cfs @ 12.01 hrs, Volume= 8,415 cf
Outflow = 0.23 cfs @ 11.59 hrs, Volume= 8,415 cf, Atten= 92%, Lag= 0.0 min
Discarded = 0.23 cfs @ 11.59 hrs, Volume= 8,415 cf

Routing by Stor-Ind method, Time Span= 0.00-110.00 hrs, dt= 0.01 hrs
Peak Elev= 3.01' @ 12.72 hrs Surf.Area= 4,024 sf Storage= 3,048 cf

Plug-Flow detention time= 93.3 min calculated for 8,414 cf (100% of inflow)
Center-of-Mass det. time= 93.3 min (879.6 - 786.3)

Volume	Invert	Avail.Storage	Storage Description
#1	2.00'	15,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2.00	2,000	0	0
3.00	4,000	3,000	3,000
4.00	6,000	5,000	8,000
5.00	8,000	7,000	15,000

Device	Routing	Invert	Outlet Devices
#1	Discarded	2.00'	**5.000 in/hr Exfiltration over Surface area below 2.01'**

Discarded OutFlow Max=0.23 cfs @ 11.59 hrs HW=2.03' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.23 cfs)

Figure 14: Pond summary sheet demonstrating constant velocity exfiltration. Items in red should be highlighted on the final output.

5.7.2 Constant Flow Rate Infiltration

The other acceptable option is Constant Flow Rate Infiltration. With this method, the field verified infiltration rate is multiplied by the surface area of the bottom of the practice to produce a volumetric flow rate. Through unit conversion the rate can be entered into the model in cfs and applied to all water surface elevations in the basin. This will produce a comparable result as the Constant Velocity Infiltration method. Using the previous example of a basin with a bottom area of 2,000 sf, a bottom elevation of 2.00 ft., and an infiltration rate of 5.00 in/hr the same result should be achieved:

$$Q = V \times A$$

$$Q = 5\frac{in}{hr} \times 2000\ ft^2 \times \frac{1\ ft}{12\ in} \times \frac{1\ hr}{3600\ s} = 0.23\ \frac{ft^3}{s}$$

The calculated flow rate can then be entered into the model using the Constant Flow Rate option as follows:

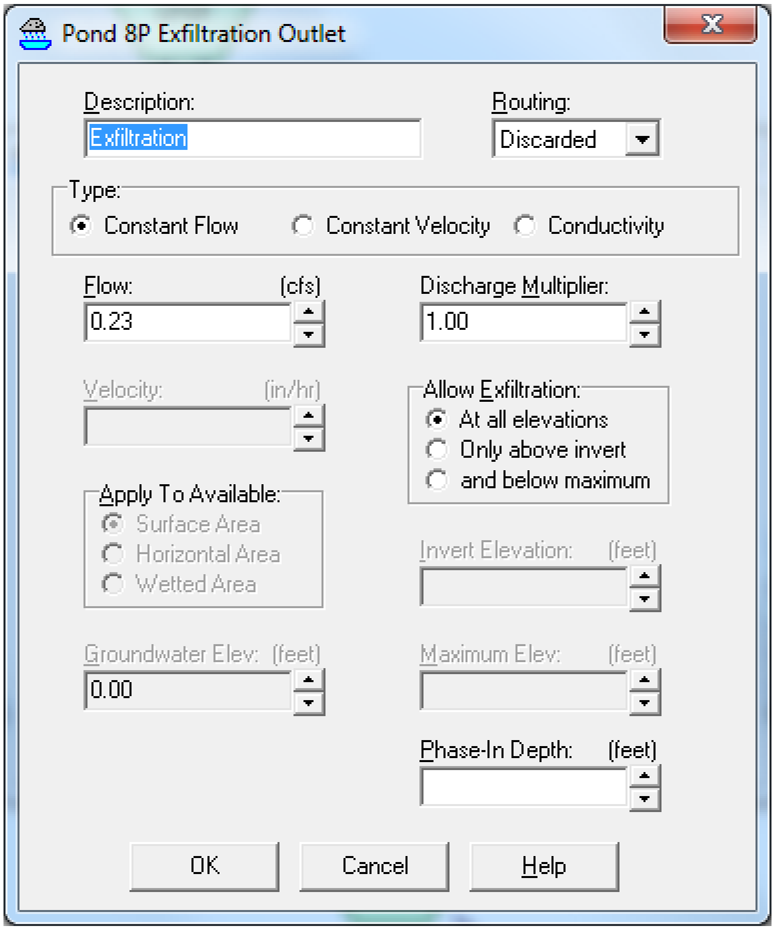

Figure 15: Exfiltration screen showing constant flow rate exfiltration.

Running the model with the calculated flow rate will yield an almost identical result to the Constant Velocity Infiltration method:

```
Inflow Area =       119,790 sf,  36.36% Impervious,  Inflow Depth =  0.84"   for  1-yr event
Inflow      =       2.95 cfs @   12.01 hrs,  Volume=           8,415 cf
Outflow     =       0.23 cfs @   11.57 hrs,  Volume=           8,415 cf,  Atten= 92%,  Lag= 0.0 min
Discarded =         0.23 cfs @   11.57 hrs,  Volume=           8,415 cf

Routing by Stor-Ind method, Time Span= 0.00-110.00 hrs, dt= 0.01 hrs
Peak Elev= 3.02' @ 12.75 hrs   Surf.Area= 4,032 sf   Storage= 3,065 cf

Plug-Flow detention time= 96.0 min calculated for 8,414 cf (100% of inflow)
Center-of-Mass det. time= 95.9 min ( 882.3 - 786.3 )

Volume        Invert       Avail.Storage    Storage Description
  #1           2.00'          15,000 cf     Custom Stage Data (Prismatic) Listed below (Recalc)

 Elevation          Surf.Area          Inc.Store        Cum.Store
    (feet)             (sq-ft)        (cubic-feet)     (cubic-feet)
      2.00              2,000                   0                0
      3.00              4,000               3,000            3,000
      4.00              6,000               5,000            8,000
      5.00              8,000               7,000           15,000

Device    Routing             Invert    Outlet Devices
   #1     Discarded            2.00'    0.23 cfs Exfiltration at all elevations

Discarded OutFlow  Max=0.23 cfs @ 11.57 hrs  HW=2.03'   (Free Discharge)
└─1=Exfiltration  (Exfiltration Controls 0.23 cfs)
```

Figure 16: Pond summary sheet showing constant flow rate exfiltration. Compare to Figure 14. Items in red should be highlighted on the final output.

5.8 Modeling Open Channel Systems: Pre-treatment Swales and Conveyance Swales

When modeling is necessary to demonstrate design conformance with the Required Elements for Pre-Treatment Swales and Conveyance Swales (where applicable), the following should be highlighted in the modeling output:

- Peak velocity associated with the Water Quality Storm and the 1-year storm. Must be ≤ 1 fps for the Water Quality Storm and non-erosive for the 1-year storm.
- Minimum Travel Time (residence time) for the Water Quality Storm
- Channel Geometry (length, bottom width, side slopes)
- Flow Depth
- Manning’s Number (varied with depth for different storm events)
- Longitudinal Slope
- Freeboard during 10-year storm (must be at least 6” during peak depth)

An example for a Pre-Treatment Swale is included below:

```
Inflow Area =       2.150 ac,  18.60% Impervious,  Inflow Depth >  0.13"   for  WQ event
Inflow      =       0.38 cfs @   12.00 hrs,  Volume=          0.024 af
Outflow     =       0.26 cfs @   12.17 hrs,  Volume=          0.023 af,  Atten= 32%,  Lag= 10.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.35 fps,  Min. Travel Time= 6.3 min
Avg. Velocity = 0.13 fps,  Avg. Travel Time= 16.4 min

Peak Storage= 99 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 2.00'  Flow Area= 20.0 sf,  Capacity= 27.77 cfs

4.00'  x  2.00'  deep channel,  n= 0.150
Side Slope Z-value= 3.0 '/'   Top Width= 16.00'
Length= 130.0'   Slope= 0.0154 '/'
Inlet Invert= 10.00',  Outlet Invert= 8.00'
```

Figure 17: Reach summary sheet showing the conformance with the required elements of a Pre-Treatment Swale. Items highlighted are representative of required design elements, however may require other storm event modeling in addition to the WQ storm event.

Part 6: Plan Sheet Guidance

Site plans and maps shall be drawn at an appropriate scale to clearly depict stormwater management design and details. Plans should be in a single separate pdf called "Attachment 5: Plans". They should be in the following order: Existing condition, proposed condition, construction details.

All plan sheets must include:

1. Legend
2. Scale bar
3. North arrow
4. Site boundary
5. Labeled discharge points and points of interest (if applicable)
6. Labeled locations of STPs including Pre-Treatment Practices
7. Subcatchment boundaries and labels that correspond with subcatchment/reach/pond names in the runoff modeling
8. Delineation of impervious types including new impervious, treated existing impervious, untreated existing impervious and redeveloped impervious
9. Time of concentration information for each subcatchment (average catchment slope (Y) and hydraulic length (*l*))
10. Dated plans including current revision dates (as applicable)

- **Existing conditions site plan**: Depict all existing features and existing condition subwatershed delineations and time of concentration information utilized in modeling, and shall depict discharge points and points of interest (if applicable). This plan sheet may include an overlay of the soil series and hydrologic soil groups. Infiltration evaluation and testing locations may be identified on this plan sheet or other site plans.

- **Proposed conditions site plans**: Identify existing impervious, redeveloped impervious, removed impervious, and new (expanded) impervious clearly in the legend. Label Discharge Points (and POIs) and all STPs and Pre-Treatment Practices that are utilized for treatment, including disconnection areas. Proposed conditions plans shall also depict post-development subwatershed delineations and time of concentration information utilized in modeling. Identify access points for maintenance of STPs where necessary. Identify areas that are subject to the Post-Construction Soil Depth and Quality Standard, including areas that will remain undisturbed and protected from compaction during construction, and verification testing locations. Multiple plan sheets may be necessary to provide the required information.

- **Detail sheet:** Include all applicable STPs for the project, including Pre-Treatment Practices, and disconnection details (if applicable) demonstrating adherence to the required design criteria including; pond cross sections, outlet structures with orifice placement, barrel dimension, and all applicable design details. Also include typical details when and where practices requiring specific criteria will be utilized to meet applicable treatment standards. Methods proposed for compliance with the Post-Construction Soil Depth and Quality Standard, along with notes for contractor shall be included as applicable. The detail sheet shall also include construction notes regarding phasing and routing of stormwater to sensitive practices such as infiltration practices prior to their completion.

- **Annotated Maintenance Plan:** Include a plan sheet identifying all STPs, including pre-treatment practices and disconnection areas, that are included in the stormwater treatment system design. For each practice, identify maintenance activities that should be regularly performed and specific conditions that indicate that maintenance is needed. This plan is to aid the permittee in maintaining their stormwater practices and performing annual inspections, and should be organized with them in mind.

- Other plan sheets may be included if they are applicable to stormwater management.

Part 7: Sediment Offset Calculation Guidance

This guidance is offered in addition to the information provided in 10 V.S.A. §1264, and Appendices A and B of Chapter 22: Stormwater Management Rule for Stormwater-Impaired Waters. A new discharge or the expanded portion of an existing discharge must meet the requirements of the Vermont Stormwater Management Manual and must not increase the sediment load in the receiving stormwater-impaired water. In cases where a project will result in an increase, a sediment offset may be required. An existing discharge, including for redevelopment must show no increase in sediment load over the existing condition. The individual discharge permits in conjunction with permitted offset projects in stormwater-impaired watersheds will result in the statutorily established no increase in sediment load to stormwater-impaired waters. No increase in sediment load can be established through on-site treatment, an on-site or off-site offset project, or through payment of a stormwater impact fee, as stated in Appendix B of Chapter 22, when sediment capacity is available under an existing permitted stormwater offset project. If your project falls within the watershed of one of the Stormwater-Impaired Waters listed on the 303(d) list, please contact your District Analyst to determine if an offset is necessary, and if applicable, whether capacity is available in an existing permitted offset project.

If all runoff from the site can be infiltrated into the ground up to the 1-year, 24-hour storm, no offset will be required, and the no increase in sediment load will be considered met. Guidance on the calculation of sediment loading for pre- and post-development conditions is provided below.

7.1 Simple Method Calculations

The Simple Method is used to estimate sediment loading from stormwater runoff for urban and developing areas. Results of the sediment loading calculations show the net increase or decrease in sediment loading over pre-development or existing conditions and are used to determine the total sediment load that must be offset.

The Stormwater Program has made available a spreadsheet for the purpose of calculation of sediment loading which can be found here with other application materials: http://dec.vermont.gov/watershed/stormwater/permit-information-applications-fees/operational-stormwater-discharge-permit-application-materials. Specify each land use type and the pollutant concentration (C) value you chose to represent that use. Be sure to include a reference for where the C value was obtained and a reference for where the annual precipitation information was obtained. To the extent possible, specify uniform land use areas with individual C values as they will generate more accurate loading calculations. For example, identify the amount of parking, roads, lawns and rooftop along with their individual C values rather than using one C value for commercial or residential development. Include in the calculations what if any margin of safety was considered in the calculation. Designers are advised to consult with Stormwater Program staff on any questions related to characterization of existing or pre-development land use ahead of permit application submittal.

Chapter 8 of the New Hampshire Stormwater Manual provides a good technical reference for sediment loading calculations, including pollutant concentration values. http://des.nh.gov/organization/divisions/water/stormwater/documents/wd-08-20a_ch8.pdf. This provides background on the simple method calculations and how they should be used in estimating sediment loads from pre- and post-development conditions.

The final simple method calculations must identify between the pre- and post-development loading as well as call out the margin of safety used. Write a short summary of your findings in the Narrative document under a new heading called Sediment Offset Calculations. After calculating pre and post development loads, please include the following information on a sediment offset calculation sheet:

- Annual Pre-Development Sediment Load: _____lbs.
- Annual Post-Development Sediment Load: _____lbs.

- Post-Development Load Including Proposed Stormwater Treatment Practices (80% reduction in TSS for areas meeting Water Quality Treatment Standard): _____lbs.
- Margin of Safety ____
- Net Change in Annual Sediment Load: ____ lbs.
- Percent Change: _____%

If runoff from the site can be infiltrated into up to the 1-year, 24-hour storm, that portion of the site can apply a 100% reduction in sediment loading rather than 80% that is assigned for non-infiltrating stormwater treatment practices.

7.2 Stormwater Impact Fee Calculations

If you choose to meet the offset requirement by paying a stormwater impact fee rather than providing an on-site or off-site stormwater offset project, you must first check with the District Analyst to make sure that there is available offset capacity within the same stormwater-impaired water as the project. Some of the stormwater-impaired watersheds have established offset projects that have available sediment offset capacity that can be purchased. If there is available capacity in a particular offset project within the same stormwater-impaired watershed, and the proposed project design meets the following standards set forth in the VSMM (Water Quality, Groundwater Recharge and Channel Protection), a stormwater impact fee for sediment offset capacity may be calculated as follows:

Area of proposed impervious in acres x **$6,000** per acre = $ Total Stormwater Impact Fee

This calculation must be included in the Narrative. The applicant may wait to submit the stormwater impact fee until technical review is complete, however the stormwater impact fee must be paid before a final permit can be issued. Stormwater impact fees for projects that do not meet the specified standards may be greater as set forth in Chapter 22: Stormwater Management Rule for Stormwater-Impaired Waters, Appendix B.